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ASSOCIATION OF SLEEP QUALITY AND PSYCHOLOGICAL DISTRESS WITH FUNCTIONAL ABILITY IN PATIENTS WITH CHRONIC SPINAL CORD INJURY: A CROSS SECTIONAL STUDY AT PARAPLEGIC CENTRE, PESHAWAR

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ABSTRACT

Objectives: *Spinal cord injury (SCI) is a severe disorder that causes severe physical, psychological, and socioeconomic disabilities. The spinal cord is the primary channel of communication between the brain and the body and injuries to this portion interfere with the motor, sensory, and reflex activities. Over 200,000 individuals (primarily young males) are affected by spinal cord injury (SCI), with increasing survival rates at the cost of substantial lifelong disability and economic burden. This highlights the fact that there is a dire need of effective treatments.*

Methodology: *A cross-sectional study that was descriptive was carried out in the Paraplegic Center Peshawar within a period of six months. Cumulative sampling was applied to recruit eighty-three patients with chronic incomplete spinal cord injury. The data were gathered via interviews with the help of standardized measures: Pittsburgh Sleep Quality Index (PSQI), Depression Anxiety Stress Scale (DASS-21), and Modified Barthel Index. The statistical analysis was done on SPSS version 26 and the relative tests that were applied to measure associations were non-parametric tests.*

Results: *In 83 participants, it was found that poor sleep quality and greater psychological distress had significant association with less functional ability (p < .001) with moderate to large effect sizes, which suggests a significant effect on functional independence.*

Conclusion: *The quality of sleep and psychological distress relates much with functional ability among chronic persons of spinal cord injury. Functional independence and the suggested quality of life can be enhanced by tackling sleep issues and mental distress.*

Keywords: *Spinal cord injury, sleep quality, psychological distress, functional ability, rehabilitation.*

INTRODUCTION

Spinal cord injury (SCI) is defined as a serious health problem, which causes impairments in physical, mental, and socioeconomic status. Spinal cord is a long, tube-like structure that extends to the lower end of the brain all the way down the spine. It originates with the opening at the base of the skull and runs in the spinal canal terminating at the L112 level in adults. Lower injuries, in the thoracic (mid-back) or lower back (lumbar), tend to cause paraplegia, which is the first and second leg injury, and the third and fourth lower body injury (1-4). In a multicentric study, the authors claimed that the patients treated with the intensive inpatient rehabilitation demonstrated significant changes in the level of mobility and independence in the daily routine (FIM and SCIM) (5).

Extensive psychosocial variables are important in the adaptation of the people living with SCI. These issues have a great impact on the psychological and social adjustment, which determines the quality of life and overall rehabilitation results. Studies indicate that the level and completeness of the injury, as well as physical comorbidities, are determining factors of adjustment to SCI, but a complex combination of psychosocial factors affects it. All these aspects combine and influence the resilience of the person, their coping mechanisms and functional adaptation and are therefore critically important in ensuring effective rehabilitation and long-term outcomes (6-9). This high susceptibility demonstrates the necessity of specific mental health measures that will help to treat the synergies of SCI and external stress effect on mental health (10-16).

According to the previous discoveries, two critical problems sleep quality and psychological distress (such as the feeling of being stressed or anxious) significantly influence the effectiveness of the Spinal Cord injury (SCI) patients recovery and the restoration of their functional capacity. Physical progress of patients is usually slowed down when they experience poor sleep or get overwhelmed. Nonetheless, there is a significant gap in the study since no body has specifically looked at what occurs when patients experience poor sleep and high levels of psychological distress simultaneously. The cumulative weight of these two is real to several chronic SCI patients and we feel this significantly challenges recovery as compared to when the problem is isolated.

The current studies are necessary as they are the first attempts to examine this critical dual challenge. Through the interaction of these two factors and their influence on the capacity of a patient to cope and work, we will be able to acquire essential, combined knowledge. The results can be used to directly inform the creation of new more complete and patient-centered rehabilitation programs. Finally, our study will be able to enhance the treatment approach, which will result in increased coping mechanisms, accelerated functional recovery and increased quality of life to individuals with a spinal cord injury.

Material and Method

3.1 Introduction

The researchers in the Paraplegic Center Peshawar data of the association of sleep quality and psychological distress with the functional ability of chronically spinal cord injury patients. In the data collection, the researchers utilized the standard based questionnaire that was split into two parts and the questionnaire was completed by interviews.

The questionnaire in section one included demographic-related questions of chronic spinal cord patients. Section two had the outcome measures, comprising of questionnaires which concerned the quality of sleep and psychological distress and functional ability. On the sleep quality, the Pittsburgh Sleep Quality.

Index (PSQI) was used. In the case of psychological distress, the Depression, Anxiety and Stress Scale (DASS-21) was adopted and the Barthel Index in the case of functional ability. The subjects responded based on their status and the data were gathered out of the patients that were under rehabilitation services at the Paraplegic Center Peshawar. The Ethics Committee of the Mehboob Medical Institute (MMI) gave the study its consent.

3.2 Study Design

The research design adopted in this study was descriptive analytical cross-sectional research design to examine the relationship between sleep quality, psychological distress, and functional ability among people with chronic spinal cord injury (SCI).

3.3 Study Setting

The study was done in Paraplegic Center, Hayatabad, Peshawar, in Khyber Pakhtunkhaw, Pakistan.

3.4. Study Duration

The whole procedure, involving the recruitment of participants and their data collection were done within a period of six months, June 2025 to November 2025.

3.5 Sample Size

The initial analysis of patient records at the Paraplegic Center Peshawar showed the possible availability of around 95 to 100 eligible people. The Raosoft sample size calculator with a 95% level of confidence and margin of error of 5 percent gave a minimum sample size of 80 participants. To be able to consider potential non-responses or missing data, an extra 10% was included, which means that the final target population was 88 participants. Nevertheless, 83 participants were finally included in the study because of low availability of patients and non-responses.

3.6 Sampling Technique

The participants were selected using a consecutive sampling technique. In this design, all patients who satisfy the inclusion criteria and make visits to the center throughout the study period were invited to join the study. The same recruitment process went on in this sequence until the desired sample size was reached.

3.7 Sample Selection

A. Inclusion criteria:

Participants were included if they met the following criteria:

Patients aged 18-65 years (both ages included)

Male or female participants diagnosed with chronic spinal cord injury, with a post-injury duration of six months or more.

Incomplete spinal cord injury classified as ASIA Impairment Scale grade B, C, or D.

Injury caused by either traumatic (e.g., accident) or non-traumatic (e.g., infection or disease) etiology.

Able and willing to provide written informed consent after being clearly informed about the study.

B. Exclusion criteria:

Participants were excluded if they met any of the following criteria:

presence of a complete spinal cord injury (ASIA grade A).

Patients who had a history of major psychiatric disorders, significant cognitive impairments, or any unusual medical conditions before their spinal cord injury, which could influence their mental or physical functioning, were excluded from the study.

Unwillingness to participate or an inability to comprehend and complete the study assessments reliably.

3.8 Data Collection Procedure

After approval for our study topic from the Ethics Committee of Mehboob Medical Institute (MMI), we took an official approval letter from the Director of Mehboob Medical Institute for data collection at the Paraplegic Center Peshawar. For data collection, we visited the Paraplegic Center and submitted all the required documents in hard form to the administration. Participants were identified through patient records and recommendations from the healthcare staff. Each eligible participant, or their attendant, when necessary, was provided with a clear explanation of the study objectives, procedures, and confidentiality measures. Respondents who volunteered to participate were required to sign an informed consent form that was written. None of the personal data, e.g., names or registration numbers, were included in the questionnaires or databases. Every respondent was given an individual identification number to ensure anonymity. The final questionnaires and the electronic databases were stored safely and could not be accessed by any other party other than the research team.

After the approval, data collection was done in a period of one month where a total of 83 participants who passed the inclusion criteria were used to collect data.

3.9 Data Collection Tool

The researcher employed standard based questionnaire in collecting data and the questionnaire was divided into two sections. The interview was conducted by way of questionnaires I. Section One consisted of demographic related questions.

II. Outcome measures were found in Section Two:

The quality of sleep was also rated by the use of a self-reported tool called the Pittsburgh Sleep Quality Index (PSQI) which has nine items, all of which investigate various aspects of sleep. One of these items contains a number of sub questions pertaining to sleep disturbances. The

PSQI is scored using seven different components which represent a particular aspect of sleep quality and which are added together to form a total score. Increased scores across the world signify decreasing sleep quality.

Depression Anxiety Stress Scale (DASS-21) was used to measure psychological distress. The scale is made of three domains depression, anxiety, and stress but the current study used the overall sum of the scale to measure general psychological distress and not individual subscale of the scale. The answers were noted in a four-point Likert scale. The item scores were added together to form a total score where the higher the score the higher were the degrees of psychological distress. The maximum potential score was 0 to 126.

The functional status was assessed with the help of the Modified Barthel Index (MBI), the number of which is ten questions assessing performance in the daily activity. Individual items are rated on different scales (0- 1, 0- 2 or 0- 3) based on the complexity of a task. The cumulative score has the scale of between 0 and 20 with the high scores representing increased functional independence.

3.10 Data Analysis Procedure

All the data were coded and entered and analyzed in the Statistical Package for Social Sciences (SPSS), 26 version. The data of the participants in terms of their demographic and injury related factors such as age, sex, and injury profile, and the main variables of the study were summarized using descriptive statistical techniques. The variables were continuous (sleep quality, psychological distress, and scores of functional ability) and mean values with the standard deviation were used, and the data of categorical variables were presented in frequencies and percentages.

The Shapiro-Wilk test was used to test the distribution of continuous variables. The results revealed that anxiety and depressive stress scales measured by the Depression anxiety Stress Scale showed psychological distress.

Normality was observed in (DASS-21) and not in sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI) and functional ability measured by the Modified Barthel Index. The rank correlation coefficient of Spearman was therefore employed to determine the relationships between the sleep quality and functional ability and between psychological distress and functional ability.

To attempt further the comparison of differences in functional ability, the participants were grouped as two categories of sleepers, good sleepers and poor sleepers. The scores of the Modified Barthel Index of these two groups were compared with the help of the Mann-Whitney U test, and the effect sizes were estimated to find out the strength of the observed differences. To conduct comparisons of more than two groups, the KruskalWallis test was used to assess differences in scores of functional ability and psychological distress with the effects sizes calculated to give an idea of the practical value.

Results and Discussion

Patients with persistent spinal cord injuries who visited the Paraplegic Center in Peshawar provided data for this study. The Statistical Package for Social Sciences (SPSS), version 26, was used to enter and analyze the data. The findings were divided into two primary categories: research outcome factors and demographic traits. Three standardized assessment instruments—the Depression Anxiety Stress Scale (DASS-21) for psychological distress, the 10-item Barthel Index for functional ability, and the Pittsburgh Sleep Quality Index (PSQI) for sleep quality—as well as five demographic variables were examined. The final analysis had information from 83 participants in total.

4.1 DESCRIPTIVE STATISTICS

i) Demographic Characteristics of Participants

Table 4.1: Median and Interquartile Range of Age

Q1 Median Q3

Percentiles		5	10	25	50	75	90	95
Age (years)		18.00	19.00	21.00	40.00	50.00	60.00	61.60

Table 4.1: Median and Interquartile Range of Age
Q1 Median Q3
Table 4.1 presents the descriptive statistics of age among the study participants (n = 83). The median age of participants was 40 years, with an interquartile range from 21 to 50 years. The minimum age was 18 years, while the maximum age was 64 years. The mean age of the participants was 37.24 ± 14.98 years, indicating a wide age distribution within the sample.
Figure 4.1: Distribution of Participants by Age

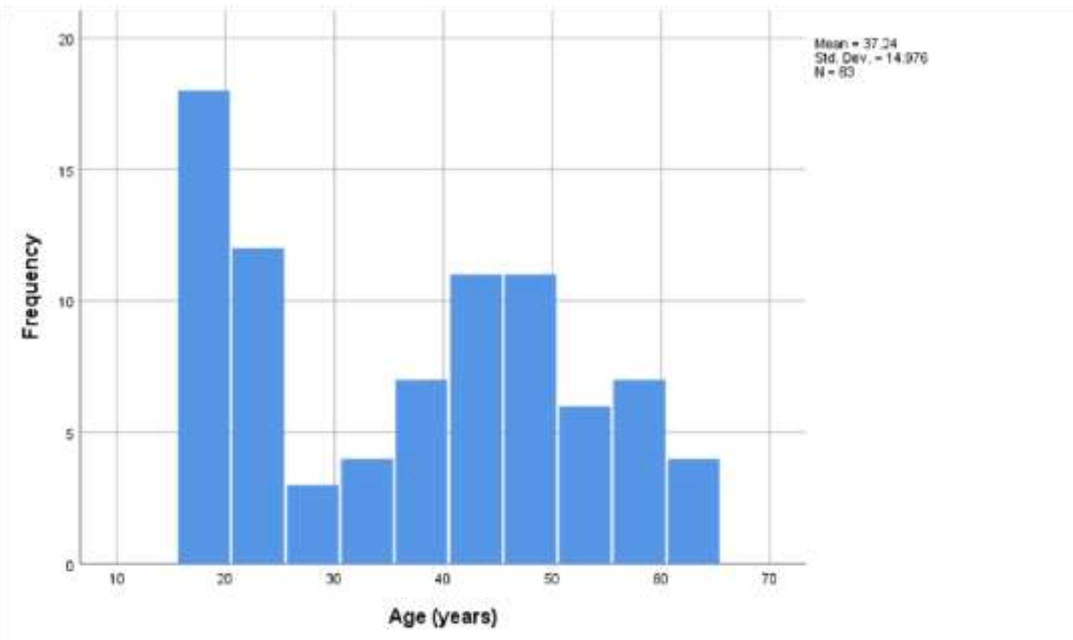

Figure 4.1: Distribution of Participants by Age

Figure 4.1 (Histogram of Age) illustrates the distribution of participants' ages. The histogram shows a moderately spread distribution, reflecting variability in age among the study population.

Table 4.2: Distribution of Participants by Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	60	72.3	72.3	72.3
	Female	23	27.7	27.7	100.0

	Total	83	100.0	100.0	

Table 4.2: Distribution of Participants by Gender

Table 4.2 shows the gender distribution of participants. Out of 83 participants, 60 (72.3%) were male and 23 (27.7%) were female. This indicates a predominance of male participants in the study sample.

Figure 4.2: Distribution of Participants by Gender

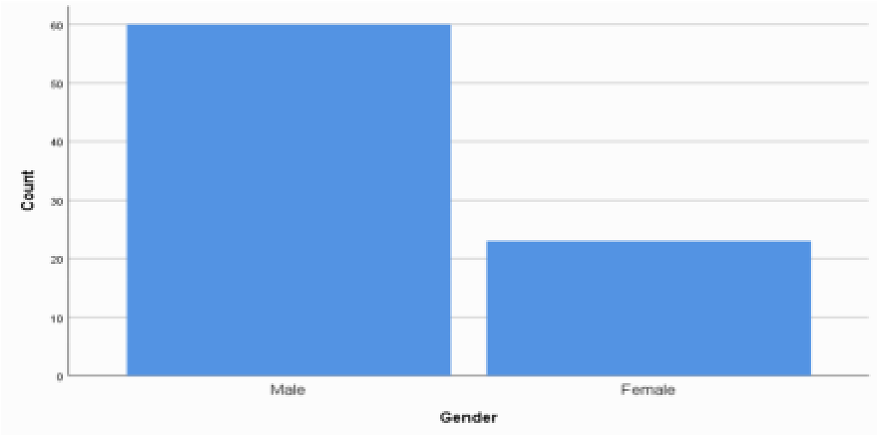

Figure 4.2: Distribution of Participants by Gender

Figure 4.2 (Bar Chart of Gender) visually represents the gender distribution, demonstrating a higher frequency of male participants compared to females.

Table 4.3: Distribution of Participants by Time Since Injury

Table 4.3: Distribution of Participants by Time Since Injury

Time since injury					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6 months	18	21.7	21.7	21.7
	7 to 12 months	10	12.0	12.0	33.7
	more than 1 year	55	66.3	66.3	100.0
	Total	83	100.0	100.0	

Table 4.3 describes the distribution of participants according to time since injury. The majority of participants (66.3%) had an injury duration of more than one year, followed by 21.7% with a duration of six months and 12.0% with a duration ranging from 7 to 12 months. This suggests that most participants were in the chronic phase of injury.

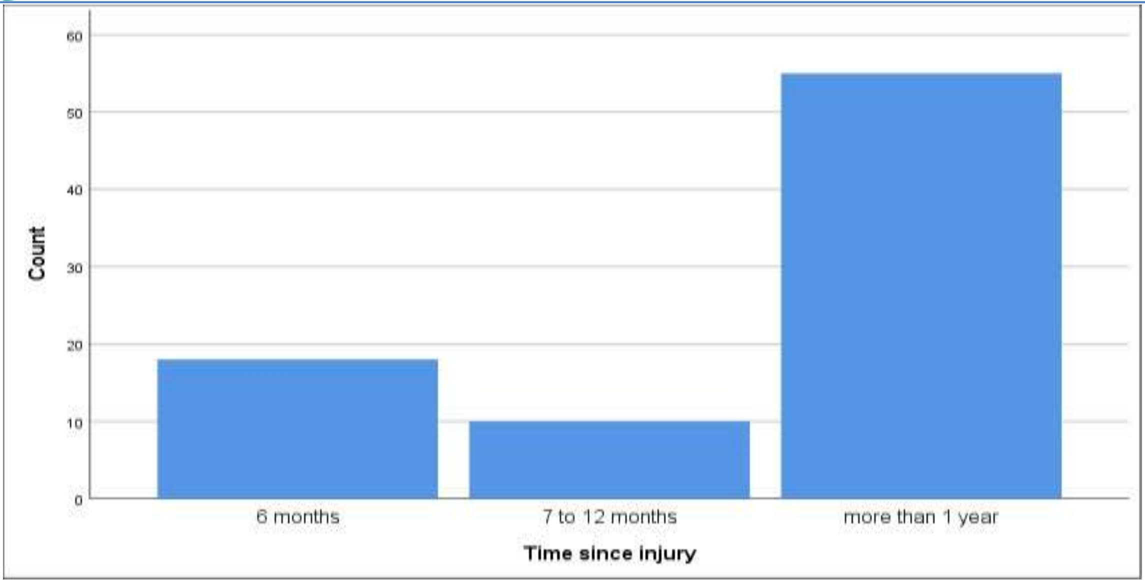

Figure 4.3: Distribution of Participants by Time Since Injury

Figure 4.3: Distribution of Participants by Time Since Injury

Figure 4.3 illustrates the distribution of participants according to time since spinal cord injury. The figure shows that the majority of participants had sustained their injury for more than one year, followed by those with an injury duration of six months, while a smaller proportion had an injury duration between seven and twelve months. This indicates that most participants were in the chronic phase of spinal cord injury.

Table 4.4: Distribution of Participants According to Level of SCI

Table 4.4: Distribution of Participants According to Level of SCI

Level of injury					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	cervical	23	27.7	27.7	27.7
	thoracic	34	41.0	41.0	68.7
	lumber	26	31.3	31.3	100.0
	Total	83	100.0	100.0	

Table 4.4 presents the distribution of participants based on the level of injury. Thoracic injuries were most common (41.0%), followed by lumbar injuries (31.3%) and cervical injuries (27.7%).

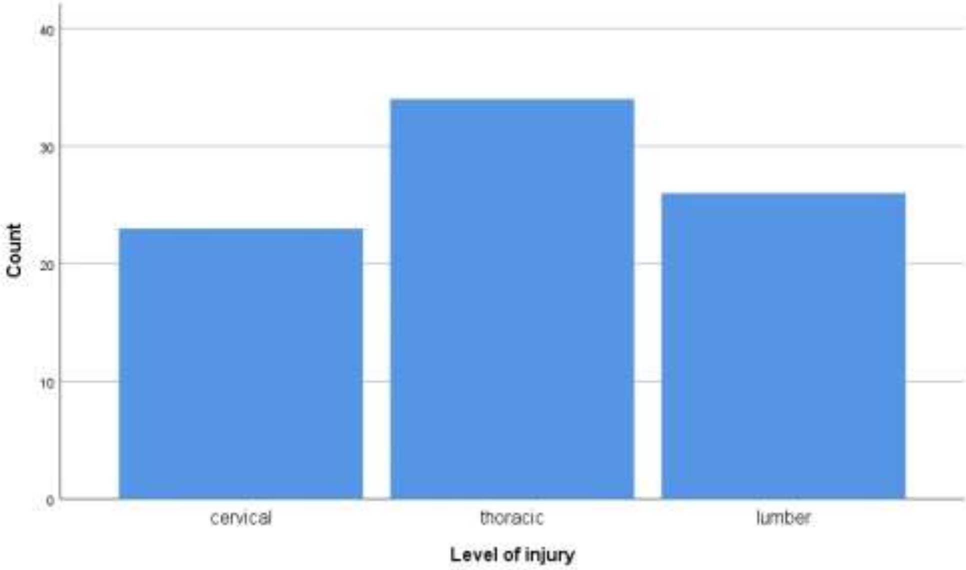

Figure 4.4: Distribution of Participants by Level of SCI

Figure 4.4: Distribution of Participants by Level of SCI
Figure 4.4 presents the distribution of participants according to the level of spinal cord injury. Thoracic injuries were the most frequent, followed by lumbar and cervical injuries. This figure highlights that thoracic-level injuries were most common in the study population.
Table 4.5 Distribution of Participants According to ASIA Impairment Scale

Table 4.5 Distribution of Participants According to ASIA Impairment Scale

ASIA grade					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Asia B	31	37.3	37.3	37.3
	Asia C	34	41.0	41.0	78.3
	Asia D	18	21.7	21.7	100.0
	Total	83	100.0	100.0	

Table 4.5 shows the distribution of participants according to ASIA grades. Most participants were classified as ASIA C (41.0%), followed by ASIA B (37.3%) and ASIA D (21.7%).

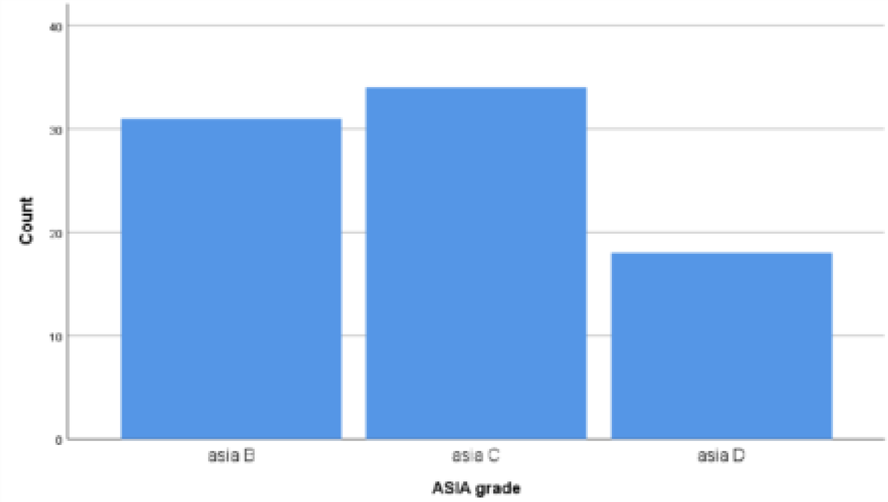

Figure 4.5: Distribution of Participants by ASIA Impairment Grade

Figure 4.5: Distribution of Participants by ASIA Impairment Grade

Figure 4.5 shows the distribution of participants based on the ASIA Impairment Scale. The majority of participants were classified as ASIA C, followed by ASIA B and ASIA D. This indicates that most participants had incomplete spinal cord injuries with varying levels of motor and sensory impairment.

ii) Study variables

Table 4.6: Descriptive Statistics of Pittsburgh Sleep Quality Index Scores

Table 4.6: Descriptive Statistics of Pittsburgh Sleep Quality Index Scores

Descriptive Statistics					
	N	Minimu m	Maximu m	Mean	Std. Deviation
psqi_total	83	1	21	8.05	4.775
Valid N (listwise)	83				

Table 4.6 presents the descriptive statistics of sleep quality measured using the Pittsburgh Sleep Quality Index (PSQI). The mean PSQI score was 8.05 ± 4.78, with scores ranging from 1 to 21.

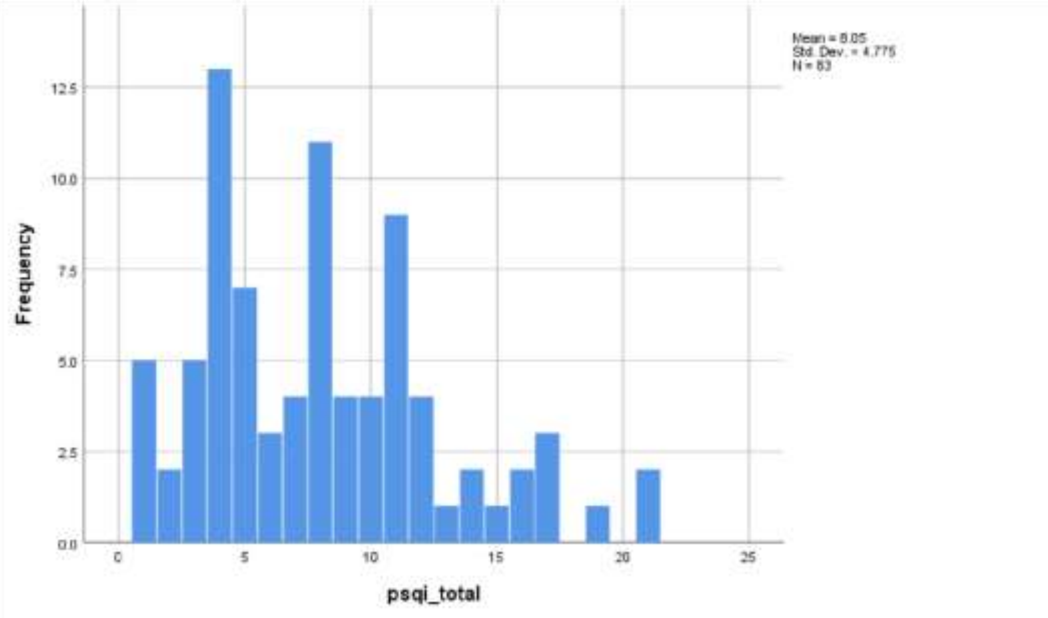

Figure 4.6: Distribution of PSQI Scores

Figure 4.6: Distribution of PSQI Scores

Figure 4.5 illustrates the distribution of Pittsburgh Sleep Quality Index (PSQI) scores among the participants. The histogram shows a wide spread of scores, indicating variability in sleep quality within the study sample.

Table 4.7: Descriptive Statistics of Depression, Anxiety, and Stress Scale Scores

Table 4.7: Descriptive Statistics of Depression, Anxiety, and Stress Scale Scores

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
dass_total	83	0	116	54.17	29.273
Valid N (listwise)	83				

Table 4.7 displays the descriptive statistics of psychological distress measured using the Depression Anxiety Stress Scale (DASS). The mean DASS total score was 54.17 ± 29.27, with values ranging from 0 to 116.

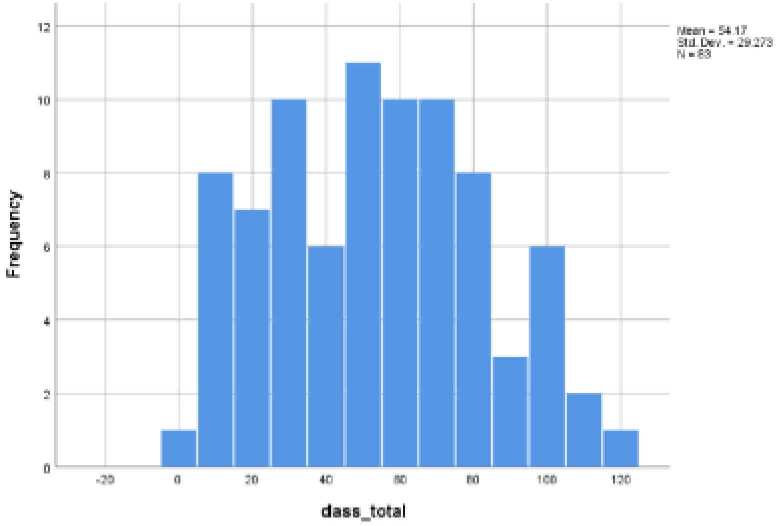

Figure 4.7: Distribution of DASS-21 Scores

Figure 4.7: Distribution of DASS-21 Scores

Figure 4.7 shows the distribution of DASS-21 total scores among participants. The histogram demonstrates a broad range of psychological distress levels, indicating variability in depression, anxiety, and stress symptoms within the study population.

Table 4.8: Descriptive Statistics of Modified Barthel Index Scores

Table 4.8: Descriptive Statistics of Modified Barthel Index Scores

	N	Minimum	Maximum	Mean	Std. Deviation
mbi_total	83	0	20	10.58	6.271
Valid N (listwise)	83				

Table 4.8 shows the descriptive statistics of functional independence assessed using the Modified Barthel Index (MBI). The mean MBI score was 10.58 ± 6.27, with a minimum score of 0 and a maximum score of 20.

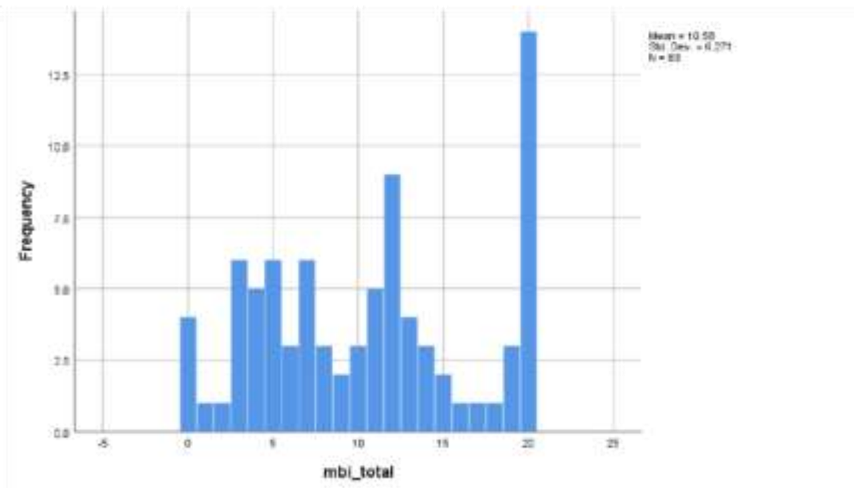

Figure 4.8: Distribution of Modified Barthel Index Score

Figure 4.8: Distribution of Modified Barthel Index Score

Figure 4.7 illustrates the distribution of Modified Barthel Index scores. The histogram indicates a wide spread of functional ability levels, showing that participants varied considerably in their level of functional independence.

iii) Combined descriptive statistics

Table 4.9: Descriptive Statistics of PSQI, DASS-21, and MBI Scores

Table 4.9: Descriptive Statistics of PSQI, DASS-21, and MBI Scores

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
psqi_total	83	1	21	8.05	4.775
dass_total	83	0	116	54.17	29.273
mbi_total	83	0	20	10.58	6.271
Valid N (listwise)	83				

Table 4.9 summarizes the descriptive statistics of all three main variables (PSQI, DASS, and MBI) together, providing an overview of central tendency and dispersion within the study sample.

4.2 TEST FOR NORMALITY

Table 4.10: Shapiro–Wilk Test for PSQI Scores

Table 4.10: Shapiro–Wilk Test for PSQI Scores

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
psqi_total	.124	83	.003	.944	83	.001

Table 4.10 presents the results of the Shapiro–Wilk test for normality of PSQI scores. The test indicated that PSQI scores were not normally distributed ($p < .05$).

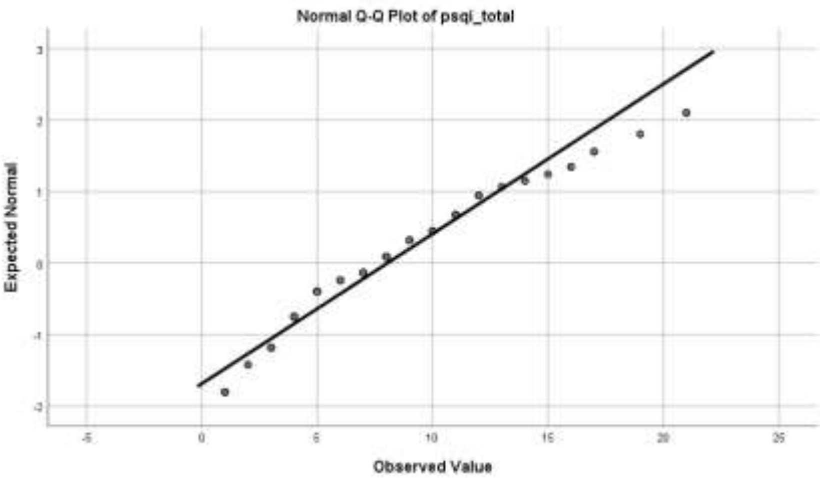

Figure 4.9: Normal Q–Q Plot of PSQI Scores

Figure 4.9: Normal Q–Q Plot of PSQI Scores
Figure 4.9 displays the normal Q–Q plot for PSQI scores. Deviations from the reference line further suggest that the PSQI scores do not follow a normal distribution.
Table 4.11: Shapiro–Wilk Test for DASS-21 Scores

Table 4.11: Shapiro–Wilk Test for DASS-21 Scores

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
dass_total	.070	83	.200*	.977	83	.132
*. This is a lower bound of the true significance.						

Table 4.11 shows the results of the Shapiro–Wilk test for DASS-21 scores. The findings indicate that DASS-21 scores were normally distributed (p > .05).

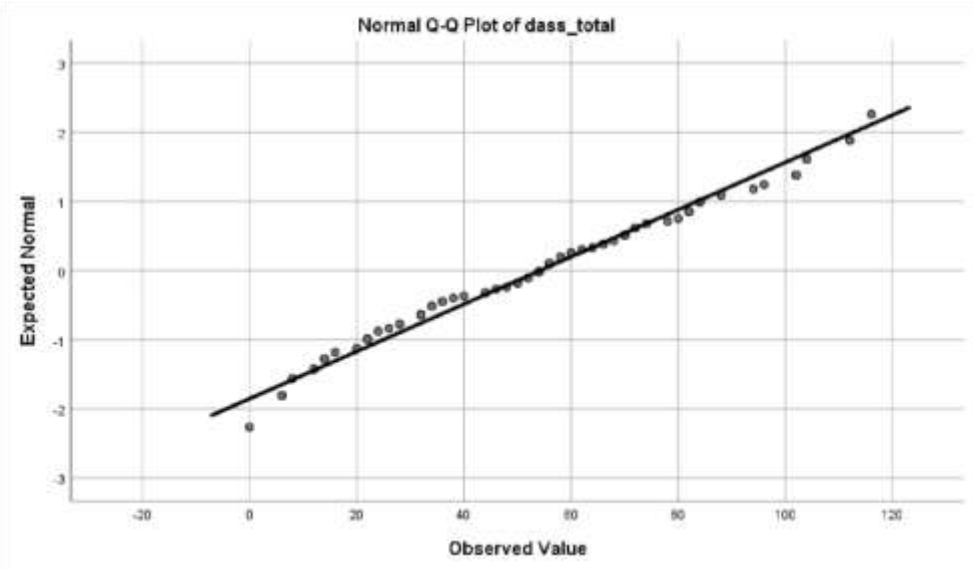

Figure 4.10: Normal Q–Q Plot of DASS-21 Scores

Figure 4.10: Normal Q–Q Plot of DASS-21 Scores
Figure 4.10 presents the normal Q–Q plot for DASS-21 scores. The points closely follow the reference line, supporting the assumption of normality
Table 4.12: Shapiro–Wilk Test for MBI Scores

Table 4.12: Shapiro–Wilk Test for MBI Scores

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
mbi_total	.115	83	.008	.930	83	.000

Table 4.12 presents the Shapiro–Wilk test results for Modified Barthel Index scores. The test showed that MBI scores were not normally distributed (p < .05).

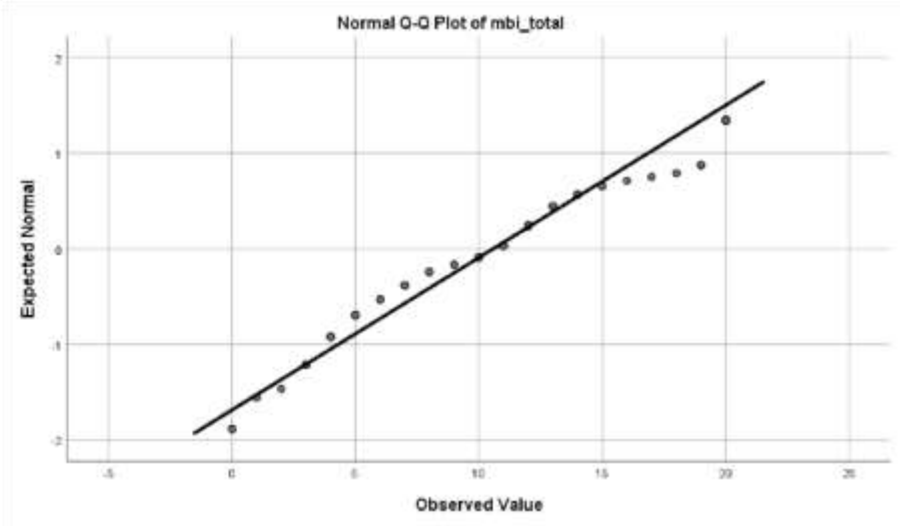

Figure 4.11: Normal Q–Q Plot of MBI Score

Figure 4.11: Normal Q–Q Plot of MBI Score
Figure 4.11 illustrates the normal Q–Q plot for Modified Barthel Index scores. The deviation of points from the reference line indicates a non-normal distribution.

4.3 INFERENTIAL STATISTICS

i) Correlation Between Sleep Quality and Functional Ability
Table 4.13: Spearman Correlation Between Sleep Quality and Functional Ability

Table 4.13: Spearman Correlation Between Sleep Quality and Functional Ability

Correlations				
			psqi_total	mbi_total
Spearman's rho	psqi_total	Correlation Coefficient	1.000	-.600**
		Sig. (2-tailed)	.	.000
		N	83	83
	mbi_total	Correlation Coefficient	-.600**	1.000
		Sig. (2-tailed)	.000	.
		N	83	83

Table 4.13 shows Spearman correlation was performed to determine the relationship between sleep quality and functional independence. The results indicated a strong negative statistically significant correlation between PSQI total scores and Modified Barthel Index scores (rho = −0.600, $p < 0.001$, n = 83). This suggests that participants with poorer sleep quality demonstrated lower levels of functional independence. The correlation was statistically significant. ii) Correlation between psychological distress and functional ability
Table 4. 14: Spearman Correlation Between Psychological Distress and Functional Ability

Table 4.14: Spearman Correlation Between Psychological Distress and Functional Ability

Correlations				
			dass_total	mbi_total
Spearman's rho	dass_total	Correlation Coefficient	1.000	-.516**
		Sig. (2-tailed)	.	.000
		N	83	83
	mbi_total	Correlation Coefficient	-.516**	1.000
		Sig. (2-tailed)	.000	.
		N	83	83

A Spearman correlation was conducted to examine the association between psychological distress and functional independence. The findings revealed a moderate negative correlation between DASS total scores and the Modified Barthel Index (rho = −0.516, $p < 0.001$, n = 83). This indicates that individuals with higher psychological distress tend to exhibit lower functional independence. The result was statistically significant.

iii) Comparison of Functional Ability Between Sleep Quality Groups

(MANN–WHITNEY U TEST)

Table 4.15: Ranks of MBI Scores According to Sleep Quality Groups

Table 4.15: Ranks of MBI Scores According to Sleep Quality Groups

Ranks				
	sleep quality group (1 good, 2 poor)	N	Mean Rank	Sum of Ranks
mbi_total	1	32	56.11	1795.50
	2	51	33.15	1690.50
	Total	83		

Table 4.15 presents the mean ranks of Modified Barthel Index (MBI) scores for participants categorized into good and poor sleep quality groups. Participants with good sleep quality (n = 32) demonstrated a higher mean rank (56.11) compared to those with poor sleep quality (n = 51), who had a lower mean rank (33.15). This distribution of ranks suggests that participants with good sleep quality tend to have higher functional ability scores than those with poor sleep quality.

Table 4.16: Mann–Whitney U Test for Functional Ability Between Sleep Quality Groups

Table 4.16: Mann–Whitney U Test for Functional Ability Between Sleep Quality Groups

Test Statistics[a]	
	mbi_total
Mann-Whitney U	364.500
Wilcoxon W	1690.500
Z	-4.241
Asymp. Sig. (2-tailed)	.000
a. Grouping Variable: sleep quality group (1 good, 2 poor)	

Table 4.16 shows the results of the Mann–Whitney U test comparing functional ability between the two sleep quality groups. The analysis revealed a statistically significant difference in Modified Barthel Index scores between participants with good and poor sleep quality ($U = 364.50$, $Z = -4.24$, $p < .001$), indicating that functional ability differs significantly between the two groups.

Table 4.17 shows the percentile distribution of Modified Barthel Index scores across sleep quality groups. Participants with good sleep quality exhibited higher median and upper-quartile MBI scores Compared to those with poor sleep quality, indicating better functional performance across most scores percentiles in the good sleep quality group.

Table 4.17: Percentiles of MBI Scores According to Sleep Quality Groups

		Sleep quality group (1 good, 2 poor)	Percentiles						
			5	10	25	50	75	90	95
Weighted Average (Definition 1)	mbi_total	1	1.95	5.30	8.75	16.50	20.00	20.00	20.00
		2	.00	2.20	4.00	8.00	12.00	14.80	19.00
Tukey's Hinges	mbi_total	1			9.50	16.50	20.00		
		2			4.00	8.00	12.00		

Overall, the Mann–Whitney U test showed a statistically significant difference in functional ability between participants with good and poor sleep quality. Participants with good sleep quality consistently demonstrated higher Modified Barthel Index scores, as reflected by higher mean ranks and higher median and upper percentile values, compared to those with poor sleep quality. The difference between the two sleep quality groups was statistically significant ($U = 364.50$, $Z = -4.24$, $p < .001$), indicating that functional ability differs according to sleep quality status. The effect size was medium-to-large ($r = 0.47$), suggesting that sleep quality has a meaningful and substantial influence on functional ability among the study participants.

iv) Comparison of Functional Ability Across Psychological Distress Severity Categories (Kruskal-Wallis Test)

Table 4.18: Ranks of MBI Scores Across Psychological Distress Severity Categories

Table 4.18: Ranks of MBI Scores Across Psychological Distress Severity Categories

Ranks			
	dass severity categories	N	Mean Rank
mbi_total	1	24	56.25
	2	19	43.97
	3	20	40.53
	4	20	24.50
	Total	83	

Table 4.18 presents the mean ranks of Modified Barthel Index scores across four psychological distress severity categories. Participants with lower psychological distress demonstrated higher mean ranks of functional ability, while participants with higher levels of psychological distress showed lower mean ranks, indicating reduced functional ability with increasing psychological distress severity.

Table 4.19: Kruskal–Wallis Test for Functional Ability Across Psychological Distress Severity Categories

Table 4.19: Kruskal-Wallis Test for Functional Ability Across Psychological Distress Severity Categories

Test Statistics[a,b]	
	mbi_total
Kruskal-Wallis H	19.287
Df	3
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: dass severity categories	

Table 4.20 shows the results of the Kruskal–Wallis test comparing functional ability across psychological distress severity categories.

The analysis revealed a statistically significant difference in Modified Barthel Index scores among the four groups, $H(3) = 19.29$, $p < .001$, indicating that functional ability varies significantly across levels of psychological distress. The findings from Tables 4.19 and 4.20 indicate that functional ability differs significantly across psychological distress severity categories. Participants with lower levels of psychological distress demonstrated higher Modified Barthel Index scores, whereas progressively lower functional ability was observed with increasing severity of psychological distress. The Kruskal–Wallis test confirmed a statistically significant difference among the four groups ($p < .001$). The calculated effect size ($\eta^2 = 0.23$) represents a large effect, suggesting that psychological distress accounts for a substantial proportion of the variability in functional ability across the severity categories.

Conclusion

In the present study, the study investigated the associations between functional capacity, sleep quality, and psychological distress in individuals with chronic spinal cord injury (SCI). Findings demonstrate that both poor sleep quality and higher levels of psychological distress are significantly associated with reduced functional independence. The findings correlate with an increasing amount of research highlighting the important role that mental health and sleep play in functional recovery. In conclusion, the results highlight the need for comprehensive rehabilitation programs to address sleep disruptions and psychological well-being because achieving so may improve functional independence and overall quality.